



Natural variation in abiotic stress and climate change responses in Arabidopsis: Implications for twenty-first-century agriculture

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Abstract:

Twenty-first-century agriculture faces the challenges of providing sufficient calories and nutrients to feed a growing human population despite climate change, increasing competition for freshwater from human and industrial use, and limited arable land. This review summarizes current knowledge concerning quantitative trait loci (QTL) and natural allelic variants in Arabidopsis that regulate tolerance of abiotic stresses associated with population pressure and climate change, including rising temperatures and atmospheric CO₂ concentrations, drought, salinity, and mineral ion limitation and toxicity. Examples of genetic variation underlying phenotypic plasticity of abiotic stress responses are also discussed. Given the extensive resources available in Arabidopsis for QTL analysis and genome-wide association studies, along with unparalleled information on gene/gene product functions and interactions, this reference plant species provides powerful resources for translational biology approaches to improve stress tolerance and yield in crop species.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Security, Food/Water Security, Other Exposure

Food/Water Security: Agricultural Productivity, Nutritional Quality

Geographic Feature:

resource focuses on specific type of geography

General Geographical Feature

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Climate Change and Human Health Literature Portal

Health Outcome Unspecified

Model/Methodology:

type of model used or methodology development is a focus of resource

Other Projection Model/Methodology

Other Projection Model/Methodology: biological network models

Resource Type:

format or standard characteristic of resource

Review

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content